In the Specification

Please amend the specification as shown in the numbered paragraphs below:

[00002] The invention relates to a device or method for depositing in particular crystalline layers on in particular crystalline substrates from the gas phase. Known devices have a heated reaction chamber with a substrate holder for receiving at least one substrate, as well as one or more heated sources, where by chemical reaction of a halogen, in particular ~~HC1~~HCl, which is fed to the source together with a carrier gas, and a metal, for example Ga, In or Al, which is arranged at the source. A gaseous halide is formed, which is conveyed through a gas inlet section to a substrate supported by a substrate holder, a hydride feedline for feeding a hydride, in particular NH_3, AsH_3 or PH_3, into the reaction chamber being also provided. In addition, a dopant can be added in order to dope the deposited semiconductor layer in the desired way. The dopant used is, inter alia, a highly dilute hydride, such as for example SiH_4, or a chloride, for example ~~$FEC1^2$~~$FECl^2$. However, it is also possible to use H_2S or an organometallic compound as carrier for the dopant. Suitable compounds of this nature include in particular DEZn or DPZMg.

[0007] The device according to the invention has one or more sources. These sources contain the metals Ga, In or Al. These sources may be arranged in the center of the substrate holder carrier, so that the halides are formed directly in the reaction chamber. Alternatively, it is also possible to generate the halides outside the reaction chamber. It is preferable for the halogen or the halides to be introduced into the center of the reactor. The source, which may be located outside or inside the reaction chamber, can be heated by means of IR light or by means of high frequency. The heating may also be effected by means of resistors. The substrate holder carrier may be rotationally driven. In this case, it rotates about the axis of symmetry of the reaction chamber in which the source is preferably arranged. The substrate holders on which the substrates, which are in circular disk form, rest during the carrying-on of the process, are disposed in the manner of satellites on the substrate holder carrier. The substrate holders themselves are rotationally driven, and for this purpose are also in the form of circular disks. The source may rotate with the substrate holder carrier or may be disposed in a fixed position in the reaction chamber. The supply of the hydride is preferably separate from the supply of the halide. The hydride feedline may be provided above the halide source. Since the growth process of the GaInAlN crystal is controlled by the presence of the hydride, NH_3, the hydride (NH_3) is only supplied immediately in front of the annularly arranged substrates, i.e. in a radially outwardly shifted position with respect to the feed of the halides. As an alternative to feeding in the hydride in a radial direction, the hydride may also emerge from openings which are arranged in the reaction chamber cover positioned opposite the substrates. These openings may be disposed uniformly over the annular substrate holder carrier. However, it is also possible for these openings, through which the hydride is passed into the reaction chamber, to be arranged in radial zones which are angularly offset with respect to one another. Between these radial zones there may be openings through which the halides are fed to the reaction chamber. The halides may in this case be produced inside or outside the reaction chamber. It is preferable for a plurality of sections for the introduction of different halides to be disposed offset with respect to one another in the circumferential direction. Introduction zones for the hydrides may be located between these sections. The sources may he disposed eccentrically, radially offset. The sources are heated. Accordingly, the metals Ga, In or Al are in liquid form. The metal may be taken up from a pan over which ~~HC1~~ HCl or another halogen flows. In the process, the ~~HC1~~ HCl reacts with the metal to form a volatile metal chloride. In particular the source for the aluminum may be configured as a container which is washed through by the gas, so that an optimum reaction takes place between the halogen and the aluminum. The source then functions similarly to a wash bottle. The substrates are disposed annularly around the center of the substrate holder carrier. They may be disposed in a very wide range of ways. By way of example, one substrate may be disposed on each substrate holder. However, it is also possible for a multiplicity of substrates to be disposed on one substrate holder. The substrate holders may be mounted on a gas cushion in a known way. The rotational drive is likewise effected in a known way by gas streams. One of the sources described can also be used to receive a dopant. The dopant used may be a metal, for example iron. However, it is also possible for the dopant to be introduced into the reaction chamber in gas form, in particular as a hydride. The dopant used may, for example, be SiH_4.

[00025] The exemplary embodiment illustrated in Fig. 2 has a source 4 which is located in the center of an annular substrate holder carrier 7. In this exemplary embodiment, the source carrier 21, on which the pans 17 or the container 18 are arranged, can rotate with the substrate holder carrier. The partition between the individual source chambers 16, which is denoted by 20 in Fig. 2, can also be dispensed with in this variant, so that all the metallic sources 4 are disposed in a common chamber. Instead of the plurality of ~~HC1~~ HCl feedlines 13 illustrated in Fig. 2, it is then only necessary to use a single ~~HC1~~ HCl feedline. However, it is also possible for the source carrier plate 21 not to rotate, but rather to remain fixed in position, so that the annular substrate holder carrier 7 rotates about the source arrangement. Particularly then, it is possible for the individual metal sources 4 to be spatially separated from one another by said partitions 20. As can be seen in particular from Fig. 3, four separate source chambers 16, in which the pans or container 18 for the different metals Ga, In or Al can be located, are formed by partitions 20. An individual ~~HC1~~ HCl feedline is associated with each source chamber 16.

[00029] In the exemplary embodiment illustrated in Fig. 5, the source carrier 21 is heated by means of an infrared heater. In this exemplary embodiment, the pans 17 for receiving the metals are located in a common source chamber 16. In this case too, however, it is also possible for a plurality of source chambers to be provided by means of suitable partitions. The halides generated by the introduction of ~~HC1~~ HCl through the feedline 13 into the chamber 16 pass, via the circumferential gap 5, into the annular reaction chamber 1, where the substrate holders 2 which rotate about the center and about their own axes are disposed. In this exemplary embodiment, the hydride (NH_3) is supplied through the cover 12 of the reaction chamber 1. For this purpose, the cover 12 has a multiplicity of hydride inlet openings 10. Overall, the cover 12 is in the form of a showerhead. In the drawings, the reference numeral 22 denotes the exhaust, which is disposed annularly around the substrate holder carrier 7.

[00030] The exemplary embodiment illustrated in Fig. 6 has a differently configured source. In this exemplary embodiment, the ~~HC1~~ HCl passes through a feedline 13 into an antechamber 23. The base of the antechamber 23 is formed by a frit 24. The frit 24 is located above a source chamber 16, so that the HCl can flow homogeneously onto the surfaces of the metal located in one or more pans 17.

[00039] While the source temperature T_S is approximately 700°c and the feedline 25 is at a temperature which is greater than the source temperature T_S, the substrate holder 2 is at a temperature T_D of approximately 1000°c or above. It is preferable for the substrate temperatures T_S to be in a range between 1000 and 1100°c. A suitable substrate is Si. However, it is also possible to use ~~$A1_2O_3$~~ Al_2O_3 substrates. The device can also be used to deposit a layer sequence. AlGaInN can be deposited simultaneously on a plurality of substrates as an interlayer. All this preferably takes place at growth rates of 100 µm/h and above. This makes it possible to produce crack-free ~~A1GaInN/GaN~~AlGaInN/GaN layers which are approximately 200 µm thick. These layers can then be separated from the original substrates by mechanical/ thermal means in order, as unsupported layers, in turn to serve as a low-defect GaN substrate. The process is carried out at a total pressure which is in the range from 1 to 1,500 mbar. It is also possible to mask the substrate with a dielectric mask prior to the coating operation. Material grows over the mask during the process. This overgrowth can be adjusted by means of the total pressure parameter. However, it is also possible to control this phenomenon by means of the temperature or the HCl flow rate or the NH_3 flow rate. The carrier gas used is preferably H_2.